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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,844	12/16/2003	Hiroaki Takehara	032190	3178

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EXAMINER

HENDRICKSON, STUART L

ART UNIT PAPER NUMBER

1754

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/20/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/735,844

Applicant(s)

TAKEHARA ET AL.

Examiner

Stuart Hendrickson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-5 and 8-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-5 and 8-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

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The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 1, 4, 11-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kronholm et al. (2004/0057896).

Kronholm teaches imperfectly combusting a hydrocarbon to make fullerenes followed filtering of a mixture of soot and fullerenes using a metal filter from the high temperature exhaust gas at a controlled temperature of 400-450°C (Example 5, which collects soot and fullerenes in filter element 230 in the process figures). Kronholm also teaches using sublimation to collect fullerenes from the soot-fullerene mixture (paragraphs [0025], [0089], & claim 117).

The reference does not explicitly teach stainless steel or the exact parameters of the dependent claims, however the temperature overlaps the taught ranges and using stainless steel is an obvious expedient given its low cost and appropriate melting point. Claim 14 is obvious as a matter of choice of scale of the reactor. See paragraph 48, 66, 68. The pressure is 10-200 torr (ex. 1). Concerning the water-cooled pipe, the reference teaches conventional cooling means, and teaches water-cooling in a different part of the reactor. Using this same temperature regulation in the filtering is an obvious expedient to adjust to the required temperature in an inexpensive manner.

2. **Claims 1, 3-5, 11-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa et al. (12/5/03) in view of Howard et al. (5,273,729) and Kronholm et al. supra.

Yoshikawa et al. teach imperfect combustion of a hydrocarbon followed by passing the high temperature gas through a sintered metal filter to collect soot and fullerenes produced. Collecting the fullerenes from the soot is not taught. Howard teaches using solvent extraction to collect fullerenes from a soot mixture. It would have been obvious to one of ordinary skill in the art at the time of the invention to collect the fullerenes using solvent extraction from the soot mixture of Yoshikawa in order to collect and use the product in pure form.

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Yoshikawa does not state a filtration flow capacity for the filter used. The filtration flow capacity is a result effective variable that is based filter properties and is optimized to control filtration efficiency and caking of the filter. It would have been obvious to one of ordinary skill in the art of filtration at the time of the invention to optimize the filtration flow capacity in order to maximize efficiency and reduce caking.

Yoshikawa does not state a reactor configuration. It would have been obvious to use a vertical reactor with the burner at the top or at the bottom and the corresponding exhaust outlet at the bottom or at the top as a matter of structural necessity of preference, such as feed/exit piping location. It also would have been obvious as a matter of design choice.

Yoshikawa does not teach the feature of the temperature regulating unit. The discussion of Kronholm, *supra*, is incorporated herein.

Kronholm teaches conventional cooling means, and teaches water-cooling in a different part of the reactor. Using this same temperature regulation in the filtering is an obvious expedient to adjust to the required temperature in an inexpensive manner.

3. **Claims 1, 3-5, 8-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Alford et al. (2003/0041732) and Kronholm et al. (2004/0057896).

Alford teaches a process for making fullerenes by imperfect combustion of hydrocarbons followed by filtering of the soot and fullerenes in a heat-resistant filter. Alford also teaches that it is known in the art to extract fullerenes from soot using solvents [0004].

Alford teaches using cylindrical (see Element 2 in Figures 1-2) filtering elements, each having a bottom, wherein the gas flows from the outside to the inside ([0038] & Figure 1) and teaches the use of multiple filter elements in one filtering apparatus [0043]. Alford also teaches unclogging the filters by injecting an inert gas from the inside of the filters to the outside, thereby knocking the mixture from the filter. Although Alford does not explicitly teach "plural gangs", it does teach cleaning multiple elements with one or more gas injectors and cleaning the filters simultaneously or sequentially [0043]. It would have been obvious to one of ordinary skill in the

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art of filtration at the time of the invention to use separate injectors for groups of filter elements in view of these teachings in order to increase surface area and/or capacity.

Alford does not state a filtration flow capacity for the filter used. The filtration flow capacity is a result effective variable that is based filter properties and is optimized to control filtration efficiency and caking of the filter. It would have been obvious to one of ordinary skill in the art of filtration at the time of the invention to optimize the filtration flow capacity in order to maximize efficiency and reduce caking. The process parameters and materials used by Alford correspond to those of the applicant and a flow capacity in the claimed range is expected.

It also would have been obvious to use a vertical reactor with the burner at the top or at the bottom and the corresponding exhaust outlet at the bottom or at the top as a matter of structural necessity of preference, such as feed/exit piping location. It also would have been obvious as a matter of design choice.

Alford teaches using a temperature control device after combustion and before filtering (Figure 2, coils before filtering unit), but does not teach specific temperatures for collecting the mixture of soot and fullerenes or purification using sublimation.

Alford does not teach the temperature-regulating unit, however Kronholm teaches combusting a hydrocarbon to make fullerenes followed filtering the soot from the high temperature gas at 400-1000°C (paragraph [0065]) without collecting PAH. Kronholm extensively teaches acceptable temperatures for successfully filtering different particles including soot, fullerenes of different molecular weights, and PAH.

The discussion of Kronholm above are incorporated herein by reference.

It is taught that fullerenes and soot will be filtered when the filter inlet is controlled at about 450°C, and that C₆₀ fullerenes can be subsequently filtered at a temperature below 400°C. In view of these teachings it would have been obvious to one of ordinary skill in the art at the time of the invention to control the filter temperature of Alford at 300-400°C to collect all of the fullerenes and soot, as this is the goal of Alford.

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Kronholm also teaches that the use of sublimation is known in processes where the fullerenes are in a mixture with the soot. It would have been obvious to one of ordinary skill in the art to use sublimation to collect the fullerenes from the soot mixture in the process of Alford as an alternative to solvent extraction.

4. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Alford et al. (2003/0041732) and Kronholm et al. (2004/0057896) as applied to claim 1 above, and further in view of Howard et al. (5,273,729).

Alford teaches that it is known in the art to extract fullerenes from soot using solvents. Howard teaches using solvent extraction to collect fullerenes from a soot mixture. It would have been obvious to one of ordinary skill in the art at the time of the invention to collect the fullerenes using solvent extraction from the soot mixture of Yoshikawa in order to collect and use the product in pure form.

5. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over Alford et al. (2003/0041732) and Kronholm et al. (2004/0057896) as applied to claim 1 above, and further in view of Mueller et al. (5,458,742).

Alford teaches that it is known in the art to extract fullerenes from soot using solvents, but does not teach using sublimation to extract fullerenes. Mueller teaches using sublimation to collect fullerenes from a mixture with the soot. It would have been obvious to one of ordinary skill in the art to use sublimation to collect the fullerenes from the soot mixture in the process of Alford as an alternative to solvent extraction.

Applicant's arguments filed 10/31/06 have been fully considered but they are not persuasive.

Kronholm teaches filtering temperatures which overlap the claimed ranges. The swirling is not claimed. The exact details of the filtering/cooling unit are obvious, given the teachings of the references. From the temperatures recited, Kronholm can use anything from water to liquid

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nitrogen to cool. In order to cool, it is axiomatic that a cooling unit be present. The reactor configuration is obvious according to the scale of the reaction. See *In re Boesch* 205 USPQ 215.

The argument on pg. 12 concerning the purchase of the devices is not understood and appears to underscore the obviousness of the claimed process. One cannot purchase materials from someone, use them in a manner consistent with their stated specifications in a known process and expect to arrive at a patentable process. The repeated argument that Kronholm does not teach the claimed temperatures is not persuasive in view of the very explicit teachings of the claimed temperatures, and temperatures which overlap the claimed ranges.

The JP office action was not found.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication should be directed to examiner Hendrickson at telephone number (571) 272-1351.



Stuart Hendrickson
examiner Art Unit 1754